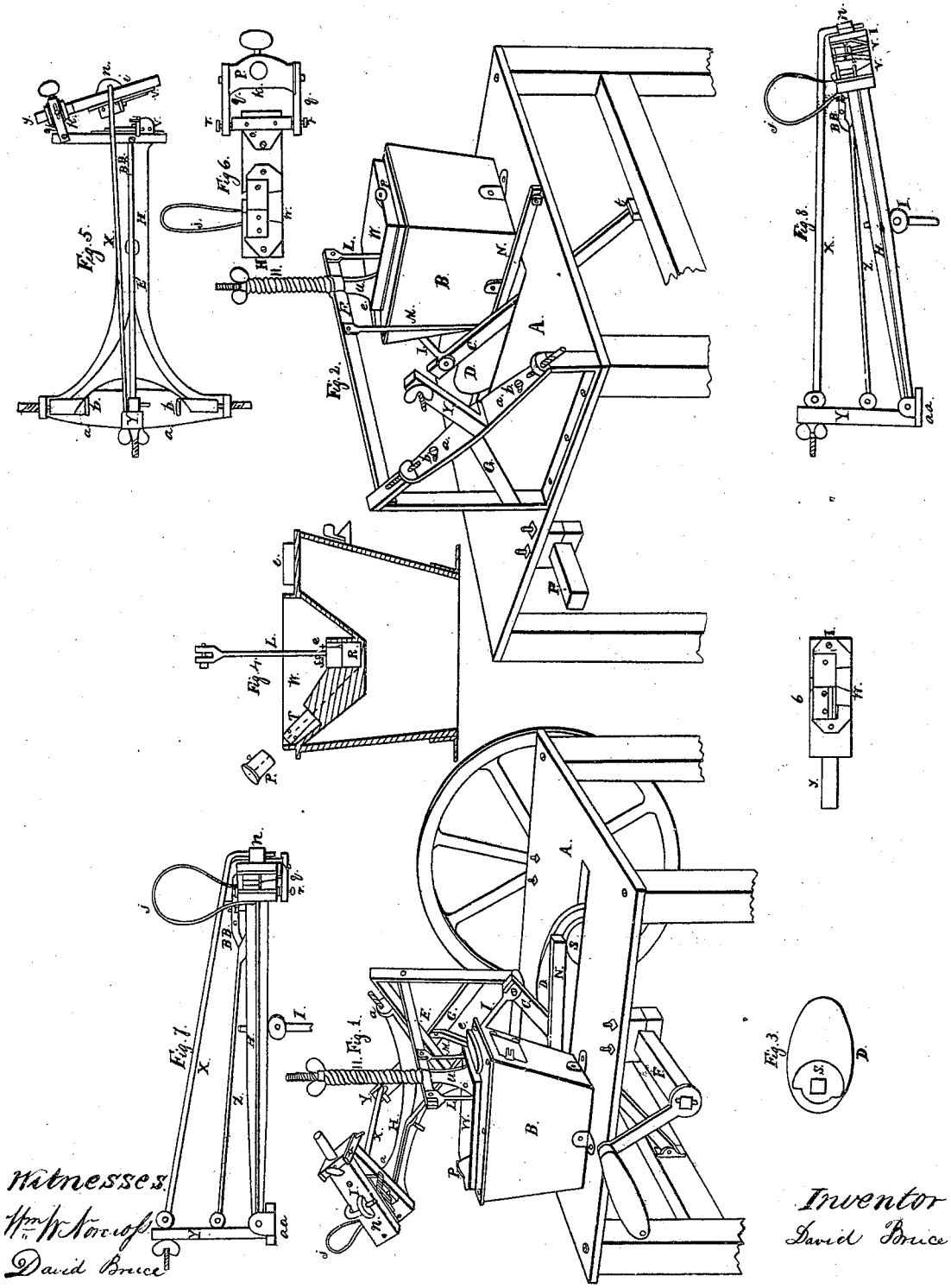
D. Bruce Jr.

Type Casting Mach.

No. 632 Patented Mar. 17. 1838.



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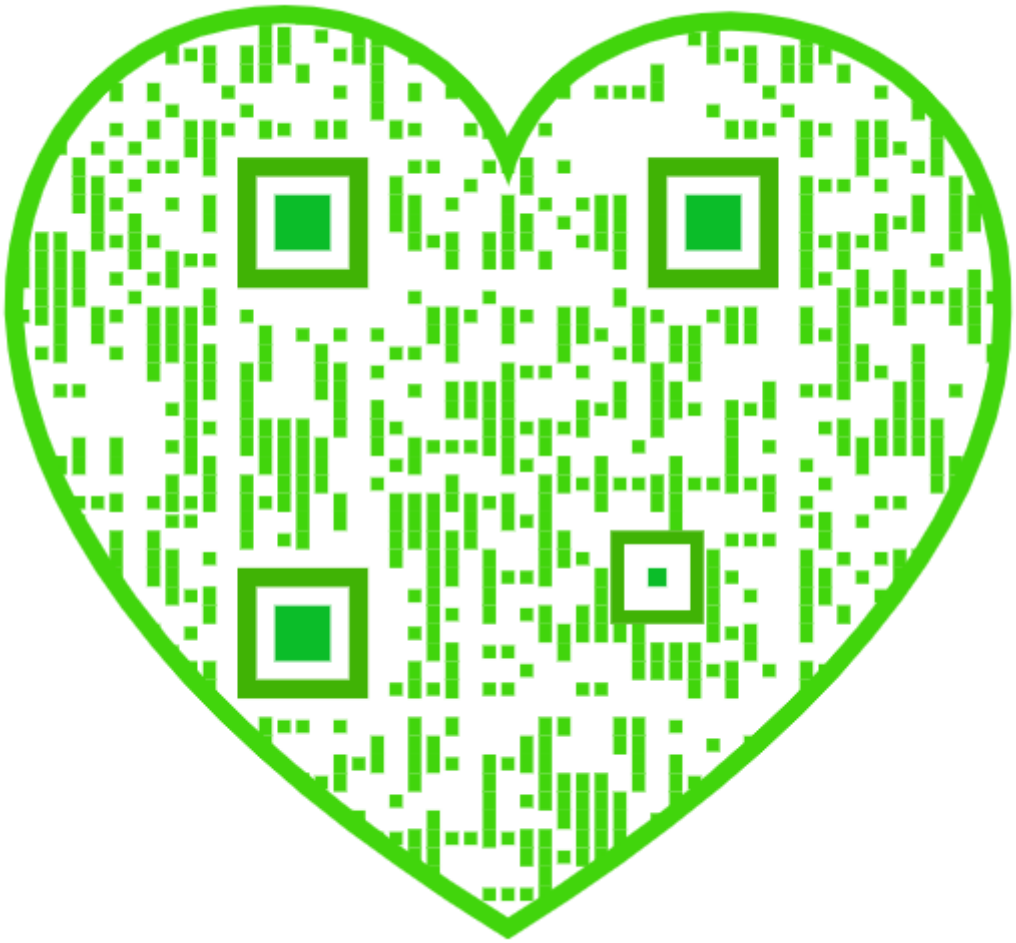

UNITED STATES PATENT OFFICE.

DAVID BRUCE, JR., OF BORDENTOWN, NEW JERSEY.

MACHINE FOR CASTING PRINTING-TYPES.

Specification forming part of Letters Patent No. **632**, dated March 17, 1838.

To all whom it may concern:

Be it known that I, DAVID BRUCE, Jr., of Burlington county, State of New Jersey, have devised, constructed, and fully tested a new Machine for Casting Printers' Types, by which the labor of the workman is much abridged and the rapidity of the operation of casting much increased.

To properly understand the various parts of the following described machine it seems necessary to state the general principles upon which it operates and some of its principal movements. The various parts of the machine are attached to a flat plate of cast-iron, which lies horizontally and serves the purposes of a table-top and foundation for the machine. Upon this flat plate is secured a small furnace and kettle, for the purpose of melting type-metal. This kettle contains a small forcing-pump, from which arises an iron pipe up to the edge of the kettle at an angle of about forty-five degrees. The mold is attached to the end of a lever, which lever is hinged at its other end to an iron frame, whose upper surface slopes at an angle of about forty-five degrees. To the oblique surface of this iron frame the mold-lever is hinged, so that the mold rises and descends upon the end of the pipe and in a line with the edge of the kettle at an angle of about forty-five degrees. This lever, with its mold, (mouth downward,) by half a revolution of the crank-shaft, is brought down to fit the end of the pipe of the pump, in which position it remains long enough to receive a discharge of metal by a descent of the pump-piston. By completing a revolution of the crank-shaft the lever and mold are raised. In raising the lever the mold is opened by means of a rod attached to one half of the mold, which at the same time loosens the type just cast, which drops out and slides into a box or paper placed to receive it. Thus, by means of a continuous motion of the crank-shaft, the mold is closed, brought in contact with the face of the pipe, a type is cast by a descent of the piston forced down by a spring, the mold is raised and opened, and the type is made to drop out. The rapidity with which type can be cast by this process depends much upon the skill of the workman, the accuracy of the machine, and the size of the type to be cast.

Having given a brief outline of its principles of action, I shall next direct attention to a perspective drawing of the machine marked Figure 1. In this view may be seen the arrangement of most of its parts, and such parts as are not apparent in this will be referred to in other drawings.

A is what I call the "bed-plate." It is of cast-iron about twenty-two inches square, to which is secured various parts of the machine. The bed-plate is cast with two holes in it, one over which the furnace B is placed. The other is for the action of a revolving double cam. To the under side of the bed-plate is attached shaft F by iron boxes. On one end of the shaft may be seen the crank, and on the opposite end the fly-wheel. Upon the side opposite the furnace may be seen the oblique frame G. This frame supports the axis of the mold-arm, hereinafter to be described. To the upper surface of the frame, Fig. 2, may be seen secured plate *a a*, which I denominate the "axis-plate," and it contains at each end the axis or pivots upon which the mold-arm H works. This plate *a a* is secured to the frame G by two screws, *b b*, which pass through slotted or elongated holes near each end. These elongated holes are for the purpose of adjusting the mold in any required position over the end of the pipe P.

I shall next describe the furnace and kettle W. The furnace B may be in form square, but I have chosen to make it largest at its upper edge to favor the molding of it when cast. It is secured to the bed-plate A by brackets or flanges cast upon it. Its door is on the same side over the shaft F, and the flue *e* of the furnace passes up on the side of the door. The kettle is firmly secured to the upper edge of the furnace B by screws passing through its flange. Fig. 4 is a sectional view of the kettle, showing its internal parts. I have chosen the inverted pyramidal form of the kettle as well adapted to let the flame play freely round its lower surface.

R represents the pump-chamber and the iron pipe T, inserted into its socket at an angle of about forty-five degrees, and in such a position that its bore will enter the pump-chamber R near its bottom. The object of this pipe is to form a communication between the pump-chamber and the mold. To do this more effectually, upon the upper end of the

pipe is placed a hollow cylinder, P, with its upper end perfectly flat and closed, excepting a small hole perforated through its center, which forms a connection and lines with the bore of the pipe T. The pipe is about half an inch in diameter and of equal thickness from the socket to the end, and the end of the pipe may be flat. The cylinder P should be bored to fit the pipe T rather loosely. It is not thought essential that there should be an air-tight fit between the inside of the cylinder P and the pipe T. On the contrary, a slight opening between the two favors the escape of air which is in the cavity of the pipe, which would, were it perfectly tight, be thrown into the mold. To favor the escape of air more perfectly, two small grooves are cut across the end of the pipe T at right angles with each other, which are intended as air-gates; but their size must not be so large as to weaken naturally the force of the pump. This hollow cylinder P is kept from being drawn off the pipe by a screw passed through its side, whose point enters a groove turned in the pipe T. The pump-chamber R is fitted with a cast-iron piston. The piston *f f* must be rather a loose fit than otherwise. It has a puppet-valve, *e*, whose seat is in the lower side of the piston, with its stem passing upward through it. The tendency of this valve (it being iron) is to float upward and fit its seat in the bottom of the piston, the specific weight of iron being less than that of fluid type-metal. The size of the pump-chamber R may be three quarters of an inch in diameter, the same in height, and the passage through the valveway a quarter of an inch; but these proportions must be varied according to the size of the type intended to be cast.

I will next proceed to describe the mold-arm H, with its different movements. Fig. 2 shows the machine without the arm. In this view the observer will readily notice the angle at which the arm is attached by observing the obliquity of the axis-plate *a a* upon the edge of the oblique frame G, before described. This angle is about forty-five degrees, and consequently the mold must rise and fall upon the end of the pipe P at the same angle.

Figs. 7 and 8 are drawings of the arm in two different positions.

Fig. 7 represents the mold as closed, as it would be when resting upon the end of the pipe P, ready to receive a cast. In this position may be seen the rod X, leading from its axis in the upright stud Y and with its other end embracing the movable half of the mold and grasping it firmly against the fixed half.

Z represents what I denominate the "matrix-rod." This rod has its axis also upon the stud Y. The other end is formed into a wedge for the purpose of tilting the matrix by passing under the lever B B. The matrix-lever B B has its center of motion about midway its length, so that when one end is lifted by the matrix-rod Z passing under it, the other end, with its adjusting-screw, tilts the matrix by pressing down upon the end of it, thus releasing the matrix from the cast, which is at liberty to be discharged from the mold.

Fig. 8 represents a profile view of the arm H raised its full height. It will be seen that elevating the arm to this position has changed the angle of the centers of both the rods X and Z, which has had the effect, as here shown, of opening the mold and tilting the matrix. The matrix-rod Z is here seen passed under the lever. I shall now give a description of the mold and how it is attached to the arm H. There is but little difference in the construction of the mold used on this machine from that used in the hand process of casting, and this consists more in the disuse of some of its parts than any deviation from its principles of construction. In these molds the brass mouths, cap, hooks, woods, and levers for tilting the matrix is dispensed with. The proportions of the jets may be something less than those of hand-molds. The back plates are about double the usual thickness and should extend about one-third of an inch beyond each end of the slides or carriages to admit of screws for the purpose of attaching it to the machine. All the screws in the back plate are countersunk, so that the back plates may be screwed flat against the end of the arm H and the movable plate *i*, hereinafter to be described. The spring *j* is attached to the arm H in such a way that its position over the mold does not vary much from the common form. V V show the position of the mold when thrown open by the rod X, exhibiting the axis of the mold-hinge *k*, the moving plate *i*, with its cylindrical slide *y* passing at right angles through the hinge *k*, and the thumb-screw for securing it in any required position. The purpose of this cylindrical slide *y* is to adjust the half of the mold *v v* thereunto attached to the various breadths of matrices intended to be cast. Fig. 6 shows a face view of the mold *v v*, one half of which is attached to the end of the arm H by screws seen in the back plate. The other half in like manner is attached to the movable plate *i*, with its cylindrical slide *y*. This movable plate contains a socket, *n*, upon its outer side for the end of the opening-rod X. The mold-hinge *k* may also be seen with its aperture for the cylindrical slide *y*, and the cross-piece *o* for the ends of its axis.

The mold-hinge *k* is susceptible of expansion and contraction for the purpose of adjusting the two parts of the mold *v v*, and for the purpose of adjusting other sized molds to the arm, if necessary. The middle section, *p*, containing the aperture for the cylindrical slide *y* has a broad flat groove at each end to admit the arms *q q*. These arms are truly fitted to the grooves and are secured in them by one screw each. The holes through which the screws pass are elongated in the arms about half an inch, and permit the arms that much extension or contraction. The arms are flat bars of iron or steel of proper length and truly adjusted to fill the grooves before mentioned.

The other end of the arms contain the points or axis *r r*, on which the hinge *k*, when properly adjusted, acts. The expansive property of the hinge may be accomplished also in the following way: The arms of the hinge may be turned cylindrical and fitted into corresponding holes in the ends of the middle section, *p*, as before described, and they may be held in their places by a screw passing through each end of the middle section, *p*, and bearing upon them.

I will proceed to describe the manner in which the arms H and the mold are brought down and raised from the end of the pipe P of the pump.

Lever marked C, Fig. 2, passes obliquely through the bed-plate at an angle of about forty-five degrees. The lower end of this lever has its center of motion under the bed-plate A and attached to a part of the stand of the machine *t*. The other and upper end rests upon the edge of the ovaling-cam D. The mold-arm H is connected with this lever by rod I, which reaches from near the upper end of this lever to an eye in the under side of the arm H, into which it is hooked, Fig. 1. Cam D is an oval, with this difference, that the hole or aperture through which the shaft F passes must be in the center of a perfect circle, so that this end of the cam shall be semicircular. The remainder or other end may be a wide-proportioned ovaling continuation. Upon the semicircular end of the cam D is attached what I denominate a "wheel-cam," S—that is, a wheel wanting one-half its periphery. (See Fig. 3.) Cam D, in performing a revolution with the shaft F, alternately raises and lowers the oblique lever C and the mold-arm H, attached by the rod I. Bar marked E is for the purpose of raising and depressing the pump-piston L, which is attached to the end of the bar overhanging the kettle *w*. The other end of the bar has its center of motion on the oblique frame G. Near the end of this bar, to which the piston is attached, is an eye, through which the upright stud *u* passes. The lower end of this stud is firmly attached to the kettle, and serves the double purpose of a steadiment to this end of the bar, while its upper end serves as a barrel for the spiral spring, *l l*, which spring is made to exert any requisite force upon the bar and piston by a thumb-nut screwed upon the upper end of the stud *u*. This pump-bar E is connected by rod M, Fig. 2, with the horizontal lever N, which latter lever has its center of motion near the edge of the bed-plate A, and is at right angles with the line of the shaft F. One end of this lever rests upon the wheel-cam *s*, before described as connected with and revolving with the ovaling-cam D. This semicircular cam *s* is so adjusted with cam D that when cam D has lowered the mold down upon the spout P of the pump the wheel-cam *s*, revolving with it the termination of its periphery, passes from under the lever N, which instantly descends with the bar and piston, being pressed strongly down by the spring *l l*, before described.

The manner of discharging the type from the mold is upon the same principle as that of hand-casting—that is, the type is made to adhere to the moving side of the mold from which it is loosened by the shank of the face being drawn against the stool upon the fixed side of the mold, which generally disengages it from the mold and allows it to fall away from it. To render the discharge more certain, as it sometimes will hang in the jet even when disengaged at the face, I attach to the fixed side of the mold a piece of metal of the thickness of common saw-blade, in form the two sides of a square or rectangle which I denominate the "discharger" *a*. One of its limbs is secured to the edge of the back plate, and reaches from thence across the jets of the mold when closed as far over as the edge of the opposite back plate. From thence the other limb commences and takes a direction downward along the jets and parallel to the back plate, and reaches as far down as the aperture of the jet. It will be observed that this discharger must be so placed as to be clear of the pipe P of the pump when the mold is down thereon. The effect of this discharger is the same as that of the stool. The type adhering to the moving side of the mold is loosened by being drawn against the stool, and the jet is likewise loosened by its sprue being drawn against the discharger.

Having given in detail a description of the parts of the machine, it will be proper to add some remarks upon their combined action during the process of casting. The fuel intended for this kind of furnace is bituminous or char coal. The temperature of the metal should be ascertained to be in a proper state which is necessary to insure regularity in the working of the machine, and cannot be known without some practice. Having placed a matrix in the mold and adjusted the movable half snugly against it, the thumb screw of the mold-hinge is then tightened to secure it in this position. The mold-rod being placed in its socket, the mold is then ready for casting. One half turn of the crank lowers the mold down upon the spout and lets the piston descend by the wheel-cam before described, passing from under the lever. The metal is suddenly injected into the mold, while, the revolution of the crank continuing, the wheel-cam again raises the pump-lever to rest upon its periphery. The mold then rises, the ovaling-cam having allowed it to remain down upon the spout at rest nearly half a revolution of the crank. Thus it will be observed that the mold and pump act only at intervals and almost simultaneously by the particular formation of the cams, while the motion of the crank is constant and continuous. The opening of the mold and the discharging of the type is going forward in the rising of the mold from the spout, so that one half the revolution of the crank the mold

is at rest and the other rising, opening, and discharging, and again closing and lowering, which movements of the mold are all going forward at the same time.

The following dimensions of some of the principal parts will enable a workman to make a machine, and the drawings may be considered sufficiently correct in their relative proportions to guide him in its general construction: Bed-plate A, about twenty-two inches square; furnace B, seven inches square at top, rather smaller at bottom, depth six inches; kettle, five and a half inches square at top, two and a half at bottom, and three inches deep; mold-arm H, thirteen inches long, breadth at hinge, seven and a half inches; length of transverse limb, five and a-half inches; large cam, four and a-half inches by three in breadth; wheel-cam *s*, two inches in diameter.

The parts of the before-described machine which I claim by right of original invention are, viz:

1. The cylindrical cover or cap P to the end of the pipe of the pump, whereby all leakage is carried back into the kettle and the air suffered to escape.

2. The oblique direction or angle of the pipe T of the pump, its bore passing down into the pump-chamber at or about an angle of forty-five degrees with the surface of the fluid metal, by which means the metal is driven in a straight line from the bottom of the pump-chamber into the mold.

3. The position of the mold upon the end of the arm, it being transverse to the length of the arm H and parallel to its axis, also the mold-hinge *k*, with its adjusting-arms *q q*, the cylindrical slide passing through it at a right-angle with its centers or axis.

4. The manner of opening and closing the mold and tilting the matrix by the rods X and Z, before described.

5. The axis-plate *a a*, by which means the arm H can be adjusted properly over the spout P.

6. The combination and arrangement of the parts, in the manner before described, to effect the purpose of casting printing-types by machinery.

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Witnesses:
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